

**RECEIVED  
CENTRAL FAX CENTER**U.S. PATENT APPLICATION NO. 10/669,043  
ATTORNEY DOCKET NO.: EMS-03-02**AUG 24 2006****Remarks:**

The Applicant would like to thank the Examiner for carefully reviewing the specification and claims. Please reconsider the application in view of the above amendments and the following remarks.

**1. Status of the Claims**

Claims 1-37 are pending in the application. Claims 1, 7, 9, 20 and 28 are independent. Claims 1, 2, 6-15, 17, 20-22, 24 and 27-37 stand rejected as anticipated by Van Yperen (U.S. Patent No. 5,402,787). Claims 16 and 23 stand rejected as obvious over Van Yperen in view of Crowley et al. (U.S. Patent No. 5,517,118). Claims 19 and 26 stand rejected as obvious over Van Yperen in view of Ochi et al. (U.S. Patent Application Publication No. 2003/0069497 A1).

**2. Claim rejections - 35 U.S.C. § 102(b)**

Independent claims 1, 7, 9, 20 and 28 stand rejected as anticipated by Van Yperen. To the extent the rejection may apply to the claims as amended, the Applicant respectfully traverses the rejection for the following reasons.

Claim 1 as amended recites a method for analyzing composition of a body portion using nuclear magnetic resonance measurements. The method includes determining a size and a position of the body portion by imaging a nuclear magnetic resonance parameter of a body in at least one dimension. A static magnetic field and a gradient magnetic field are induced in at least the body portion. A radio frequency magnetic field is induced in at least the body portion at a frequency selected to excite nuclear magnetic resonance phenomena. Nuclear magnetic resonance signals are detected from at least the body portion. The static magnetic field and the gradient magnetic field have amplitudes selected such that the nuclear magnetic resonance phenomena are induced and detected substantially entirely within the body part.

As a preliminary matter, "determining composition" as used in the Applicant's claims is clearly intended to mean quantitatively determining amounts of one or more constituent substances present within the body portion. Numerous references in the Applicant's specification

concerning the analysis performed using the NMR measurements make this definition quite clear. Prior art NMR imaging techniques, including the one shown in Van Yperen, do not include quantitative determination of constituent substances from within the particular investigated volume or body part. In NMR imaging techniques known in the art, a body being examined is segmented into relatively small image volumes, called "voxels", that are individually investigated, and for each of which a single signal amplitude value is assigned. The signal amplitude value may be derived from various attributes of spin echo amplitudes in a spin echo measurement sequence (such as CPMG) measured for each voxel. Nonetheless, each voxel has associated with it only one final measurement value. In generating a complete image of all or a portion of the body being analyzed, the discrete voxel values are applied in some form of display, usually a gray scale visual image representation. Composition of the entire body or part thereof may be inferred by summing the numbers of individual voxels for which the amplitude is a certain value or certain values. For example, bone tissue may be inferred when the signal amplitude is a preselected fraction of maximum possible signal amplitude in each voxel. The number of voxels over the entire body image represented by bone signal amplitude is then determined, and a fractional volume of bone tissue in the entire body may be determined by dividing the number of bone-containing voxels by the total number of voxels in the imaged body.

The foregoing explanation of prior art image analysis is well described in the Applicant's Background of the Invention portion of the present application.

The Applicant's claimed invention is quite different in that an amount of at least one constituent is determined in the body part from the detected nuclear magnetic resonance signals in that body part. In the Applicant's claimed invention, the body part itself constitutes an individual voxel in an image, and such voxel may encompass the entire volume of the body being analyzed. The amount of the at least one constituent is determined quantitatively from the signals measured entirely within the individual voxel. Such determination of composition is simply not disclosed in the prior art. The Applicant has outlined numerous possible advantages of using such measurement technique, including that by measuring NMR signals over a sufficiently large volume, it is possible to have substantial signal to noise ratio using relatively low static magnetic

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field amplitudes and correspondingly low RF magnetic field amplitudes. As importantly, by analyzing amounts of one or more constituents in each of a relatively limited number of image voxels (which in some implementations may be as few as one over the entire body) a body or body part composition analysis may be performed in much shorter time than by conventional image integration. Additionally, because the composition is determined only from the NMR signals in all of each body part or whole body, it is not necessary to determine the body volume to determine fractional constituent amounts, as with prior art imaging techniques. Further, certain attributes of the NMR signals acquired and processed according to the invention may be used to directly determine mass of one or more constituents of the body part or body. Such is not possible with prior art imaging techniques, which can only provide information about volume fraction of constituents inferred from image amplitudes in each voxel. Finally, the Applicant's claimed invention can determine the amount of more than one constituent in each body portion or body from the NMR signals measured in that portion or body. Such multiple component amount determination in a body portion or entire body is not disclosed or implied in any of the prior art of record.

To summarize, the prior art of record does not show determining an amount of at least one constituent in a body part using NMR signals from that body part. Accordingly, claim 1 cannot be anticipated by Van Yperen.

Claims 7, 9, 20 and 28 all include either corresponding method elements or corresponding means for performing the corresponding method element explained above with reference to claim 1. For at least the same reasons advanced with respect to claim 1, Van Yperen cannot anticipate any of claims 7, 9, 20 and 28.


Claims 2-6, 8, 10-19, 21-27, and 29-37 ultimately depend from claims 1, 7, 9, 20 and 28, respectively, and are believed to be patentable for at least the same reasons advanced with respect to the foregoing independent claims.

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This Reply is believed to be fully responsive to each and every ground of rejection cited in the Office Action of June 15, 2006, and the Applicant respectfully requests early favorable action on this application.

Respectfully submitted,

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